US008826707B2

(12) **United States Patent**
Habecke

(10) **Patent No.: US 8,826,707 B2**
(45) **Date of Patent: Sep. 9, 2014**

(54) **LOCKING DEVICE COMPRISING A KEY AND A LOCKING CYLINDER**

(75) Inventor: **Matthias Habecke**, Hattingen (DE)

(73) Assignee: **Huf Hulsbeck & Furst GmbH & Co. KG** (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 208 days.

(21) Appl. No.: **12/736,414**

(22) PCT Filed: **Apr. 10, 2008**

(86) PCT No.: **PCT/EP2008/003070**

§ 371 (c)(1),
(2), (4) Date: **Oct. 6, 2010**

(87) PCT Pub. No.: **WO2009/124571**

PCT Pub. Date: **Oct. 15, 2009**

(65) **Prior Publication Data**

US 2011/0041575 A1 Feb. 24, 2011

(51) **Int. Cl.**

E05B 27/00	(2006.01)
E05B 29/00	(2006.01)
E05B 19/00	(2006.01)

(52) **U.S. Cl.**
CPC ***E05B 29/00*** (2013.01); ***E05B 19/0017*** (2013.01); *E05B 19/0052* (2013.01)
USPC **70/357**; 70/358; 70/492; 70/409; 70/416

(58) **Field of Classification Search**
USPC 70/350–352, 357, 358, 377, 490–492, 70/405, 406, 407, 409
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,039,126	A *	4/1936	Svoboda	70/358
2,123,940	A *	7/1938	Gray	70/492
3,035,433	A *	5/1962	Testa	70/495
4,075,879	A *	2/1978	Christopher	70/337
4,148,201	A *	4/1979	Miyamae et al.	70/358

(Continued)

FOREIGN PATENT DOCUMENTS

DE	19829521	3/1999
DE	19944070	4/2001

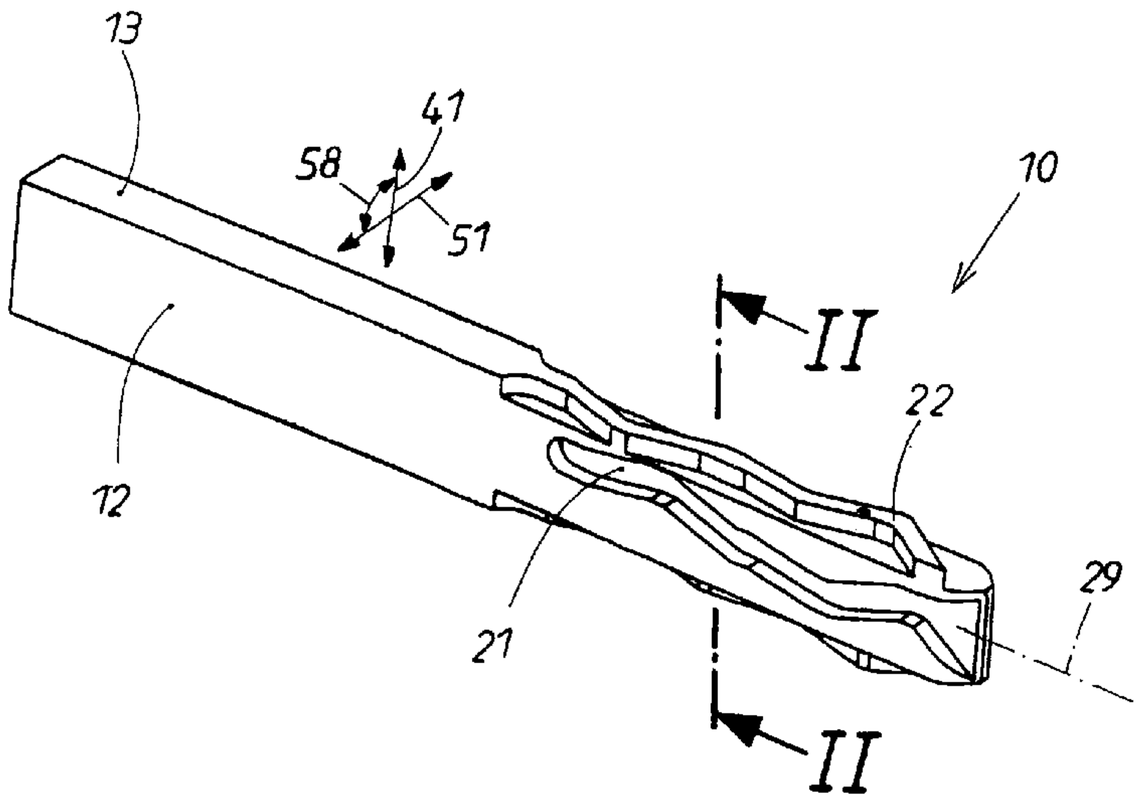
(Continued)

Primary Examiner — Suzanne Barrett
(74) *Attorney, Agent, or Firm* — Cantor Colburn LLP

(57) **ABSTRACT**

A locking device comprises a key (**10**) and a locking cylinder (**30**). The locking cylinder (**30**) in turn is composed of a stationary cylinder housing (**31**) and a cylinder core (**32**) rotatably supported therein. In order to increase the break-in safety, it is proposed to use two types of plate closures (**40**, **50**) in the cylinder core (**32**), the displacement of that closure pointing into two radial directions (**41**, **51**) that differ from each other. The key (**10**) comprises planar outer surfaces (**12**, **13**) disposed at an angle to each other, the two types of plate closures (**40**, **50**) being parallel displaceable to said surfaces. Each of the two adjoining outer surfaces (**12**, **13**) has a dedicated linear control path (**21**, **22**), which varies in adjoining key sections transversely to the key longitudinal direction (**29**) for coding the key (**10**). Accordingly, the plate closures (**40**, **50**) have a pair of mating sampling sites (**42**, **52**), which are disposed in defined positions and interact with the associated control path (**21**, **22**) when the key (**10**) is inserted and generate a mating coding analogous thereto in the locking cylinder (**30**). Each of the two types of plate closures (**40**, **50**) engages on the dedicated control path (**21**, **22**) thereof.

19 Claims, 4 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

4,434,636	A *	3/1984	Prunbauer	70/358
4,612,787	A *	9/1986	Prunbauer et al.	70/358
4,977,767	A *	12/1990	Prunbauer	70/406
5,174,141	A *	12/1992	Ohyabu	70/492
7,159,424	B2 *	1/2007	Widen	70/409
7,240,525	B2 *	7/2007	Gil	70/340
7,424,815	B1 *	9/2008	Pagnoncelli	70/340
7,484,392	B2 *	2/2009	Katagiri	70/492
7,634,930	B2 *	12/2009	Boesel et al.	70/383
7,673,484	B1 *	3/2010	Crepinsek	70/419
7,690,232	B2 *	4/2010	Klein et al.	70/409
7,870,771	B2 *	1/2011	Mueller et al.	70/409
8,261,587	B2 *	9/2012	Ḥaviv et al.	70/416
8,261,588	B2 *	9/2012	Šabata	70/492
8,276,419	B2 *	10/2012	Farrenkothen et al.	70/492
8,327,675	B2 *	12/2012	Baumann	70/494
2003/0037579	A1 *	2/2003	Wu	70/358
2003/0154752	A1 *	8/2003	Price	70/358
2004/0000178	A1 *	1/2004	Tseng	70/358
2005/0268678	A1 *	12/2005	Price	70/358
2006/0000251	A1	1/2006	Ceron et al.	
2007/0006623	A1 *	1/2007	Barrenberg et al.	70/492
2009/0025442	A1 *	1/2009	Klein et al.	70/492
2009/0266123	A1 *	10/2009	Mueller et al.	70/348
2011/0302972	A1 *	12/2011	Higuchi	70/491
2012/0279265	A1 *	11/2012	Winkler et al.	70/358
2012/0297843	A1 *	11/2012	Jacob	70/358
2013/0000368	A1 *	1/2013	Habecke	70/358

FOREIGN PATENT DOCUMENTS

DE	2025010309	12/2005
DE	102007014900	10/2008
EP	0613987	9/1994
WO	2007028484	3/2007

* cited by examiner

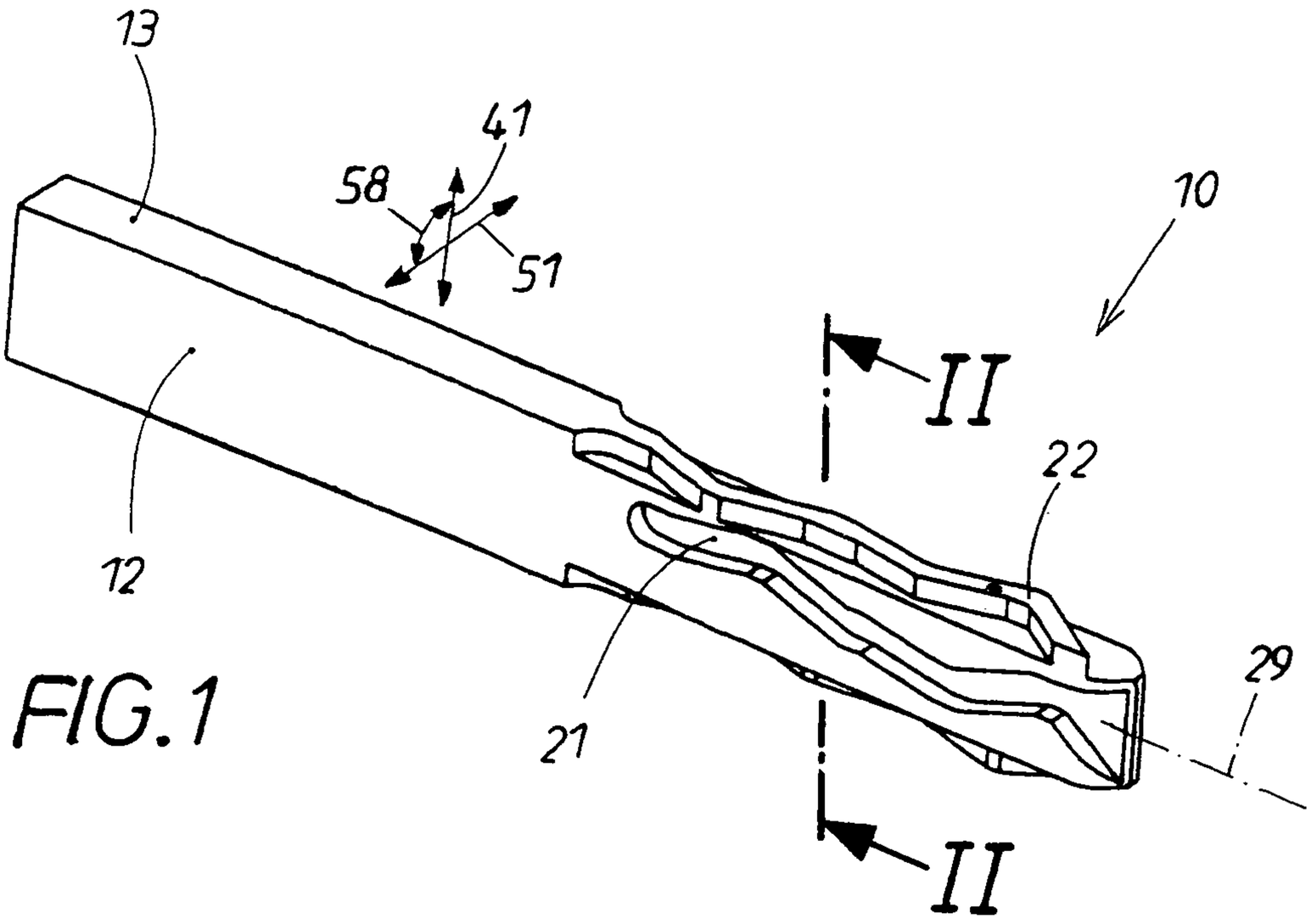

13
41
58
51
10
II
22
12
29
21
II

FIG.1

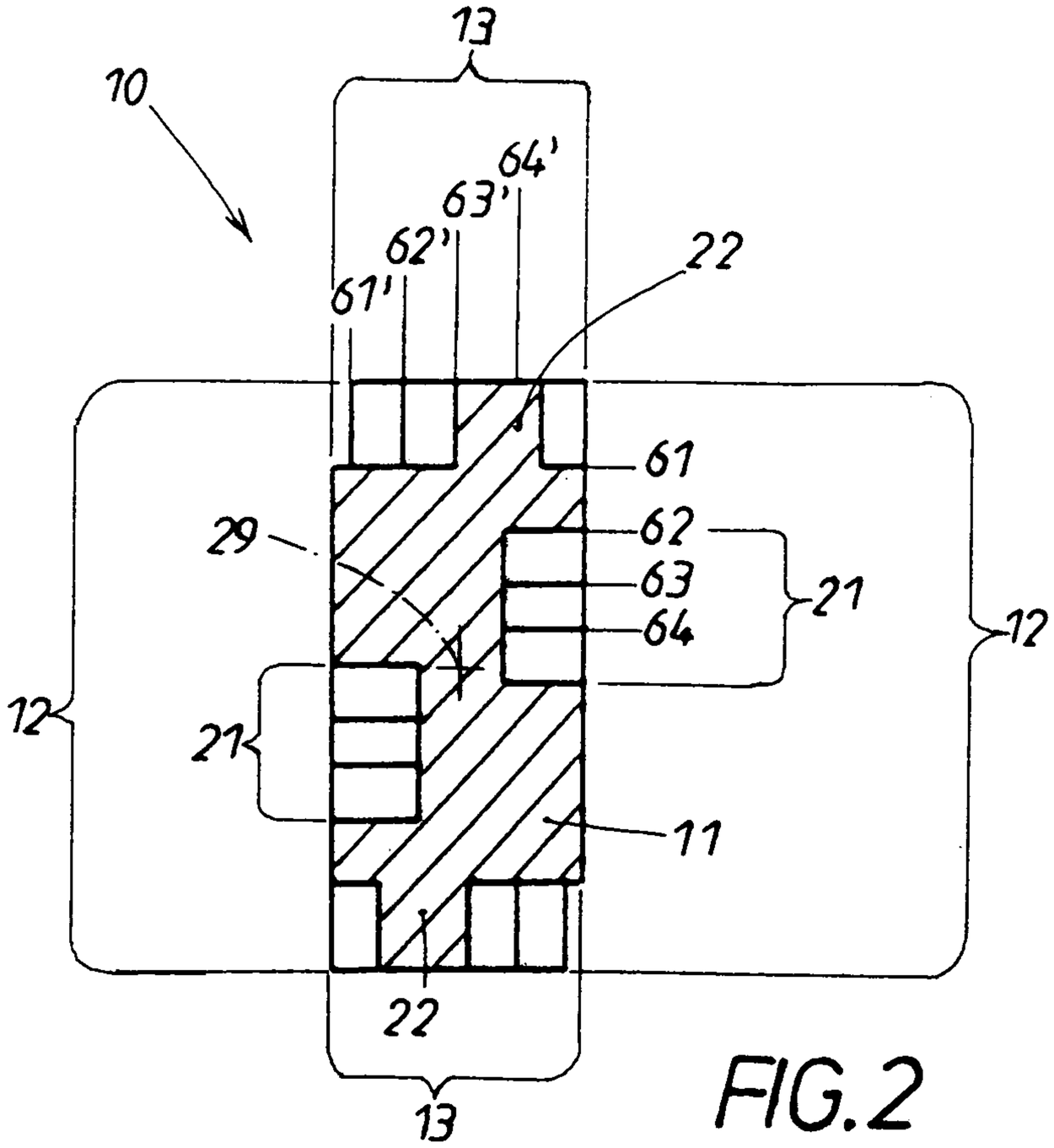

13
10
64'
63'
62'
61'
22
61
62
63
64
21
29
12
21
11
22
13

FIG.2

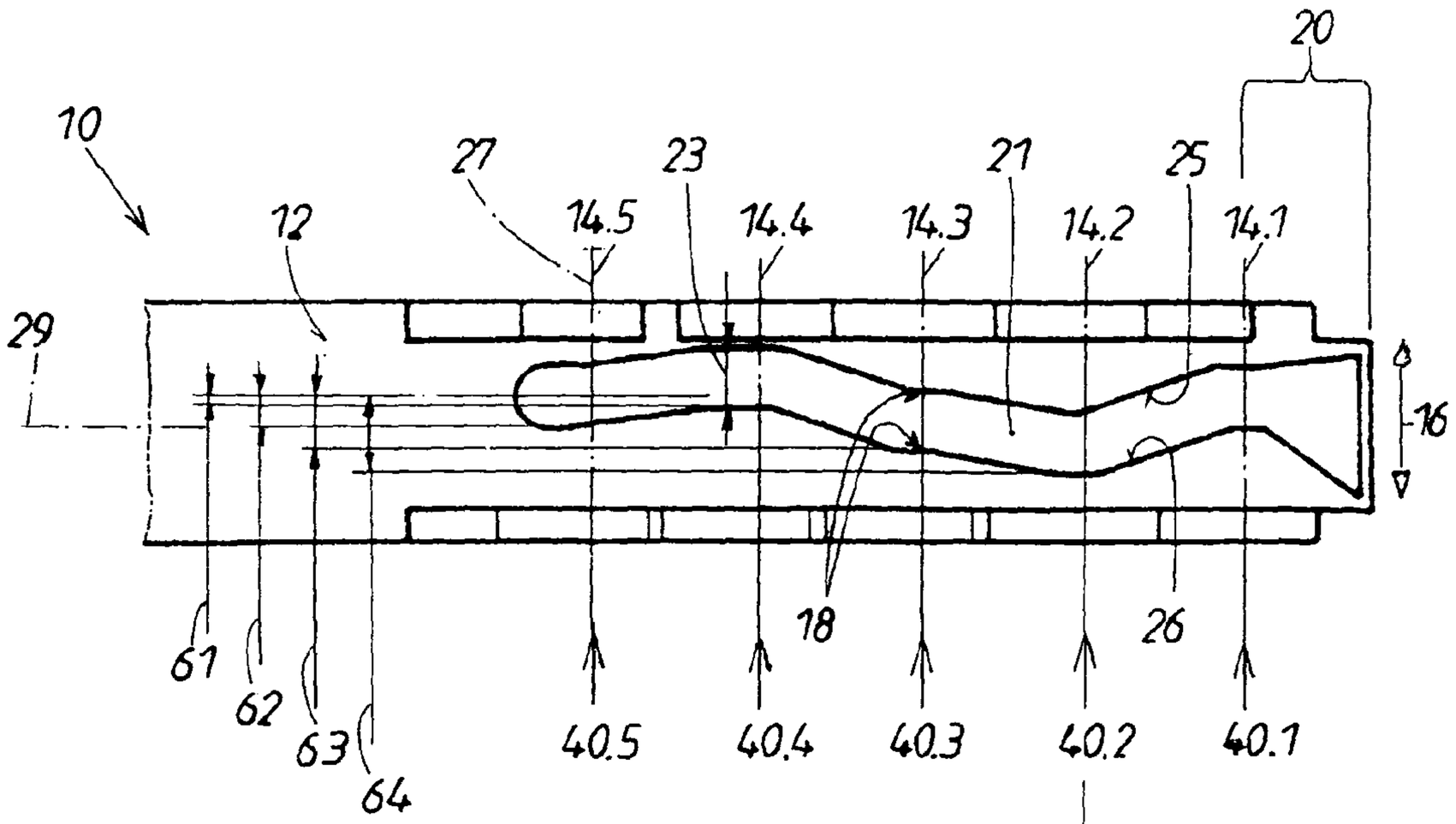

10
12
27
23
21
25
20
14.5
14.4
14.3
14.2
14.1
29
16
18
26
61
62
63
64
40.5
40.4
40.3
40.2
40.1

FIG.3

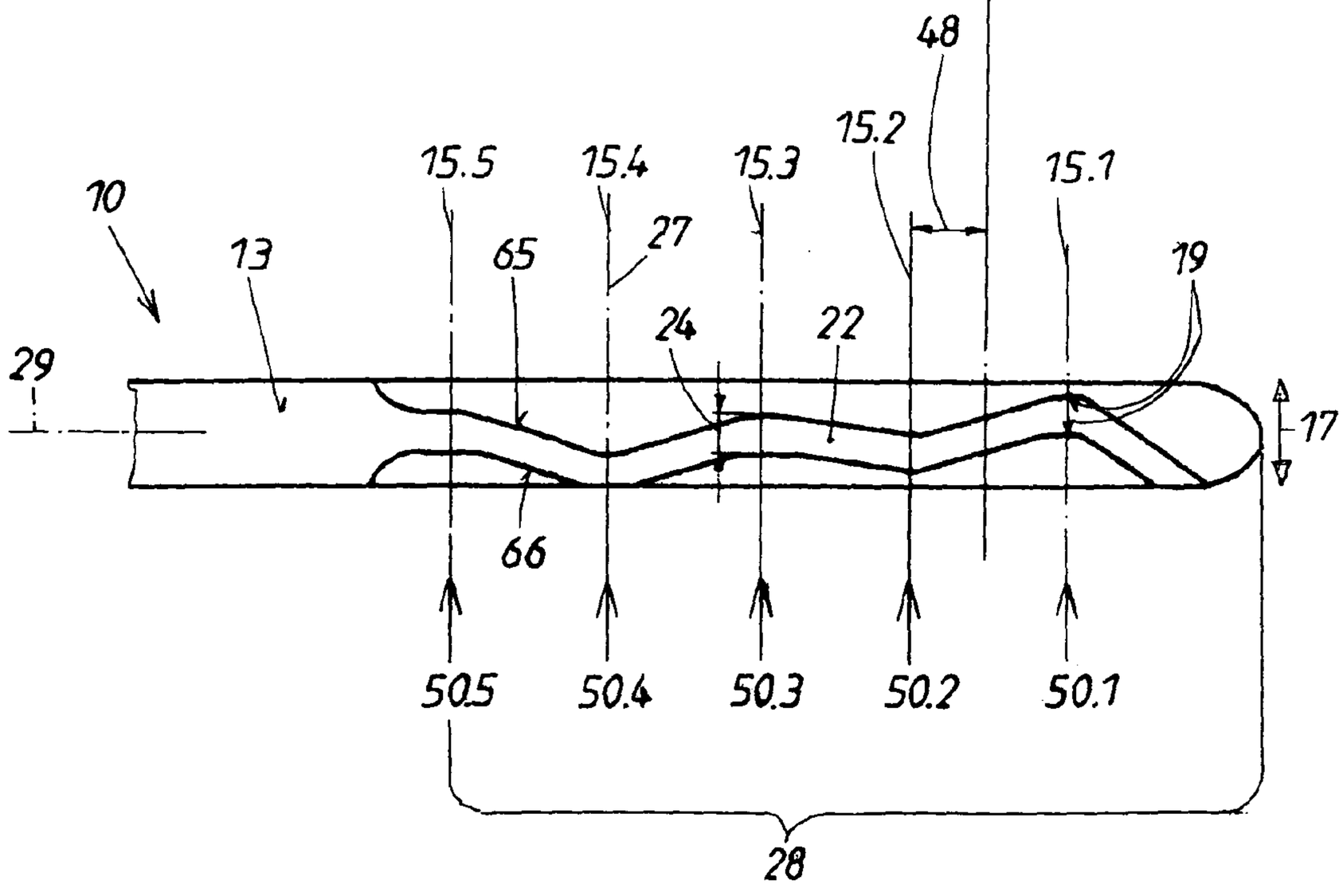

48
15.2
15.5
15.4
15.3
15.1
10
13
65
27
19
24
22
29
17
66
50.5
50.4
50.3
50.2
50.1
28

FIG.4

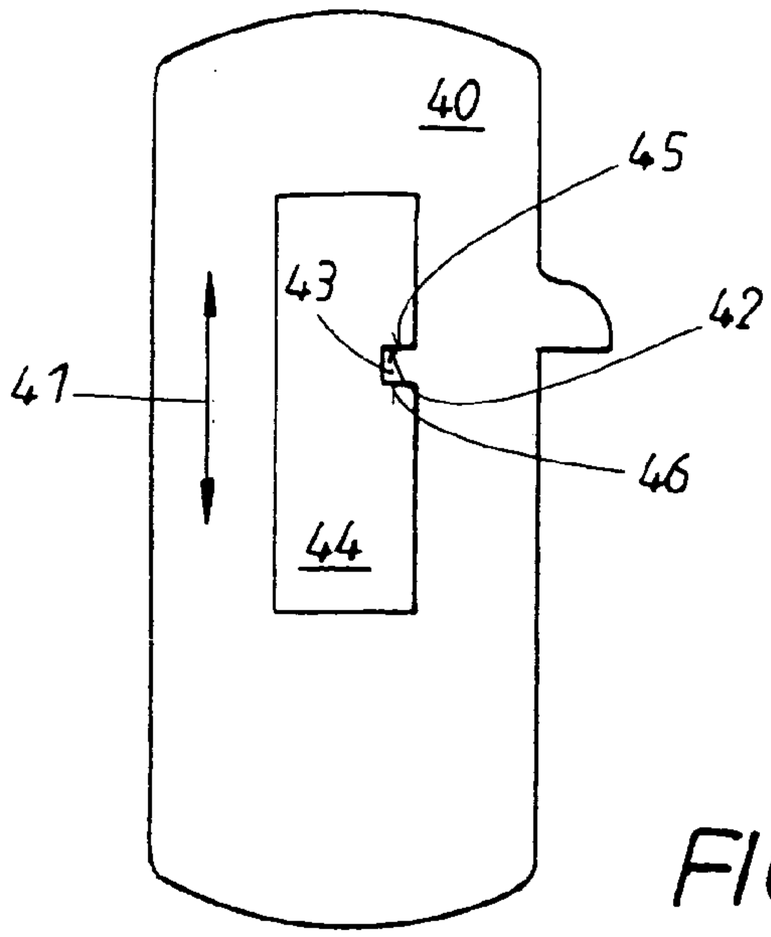


FIG.5a

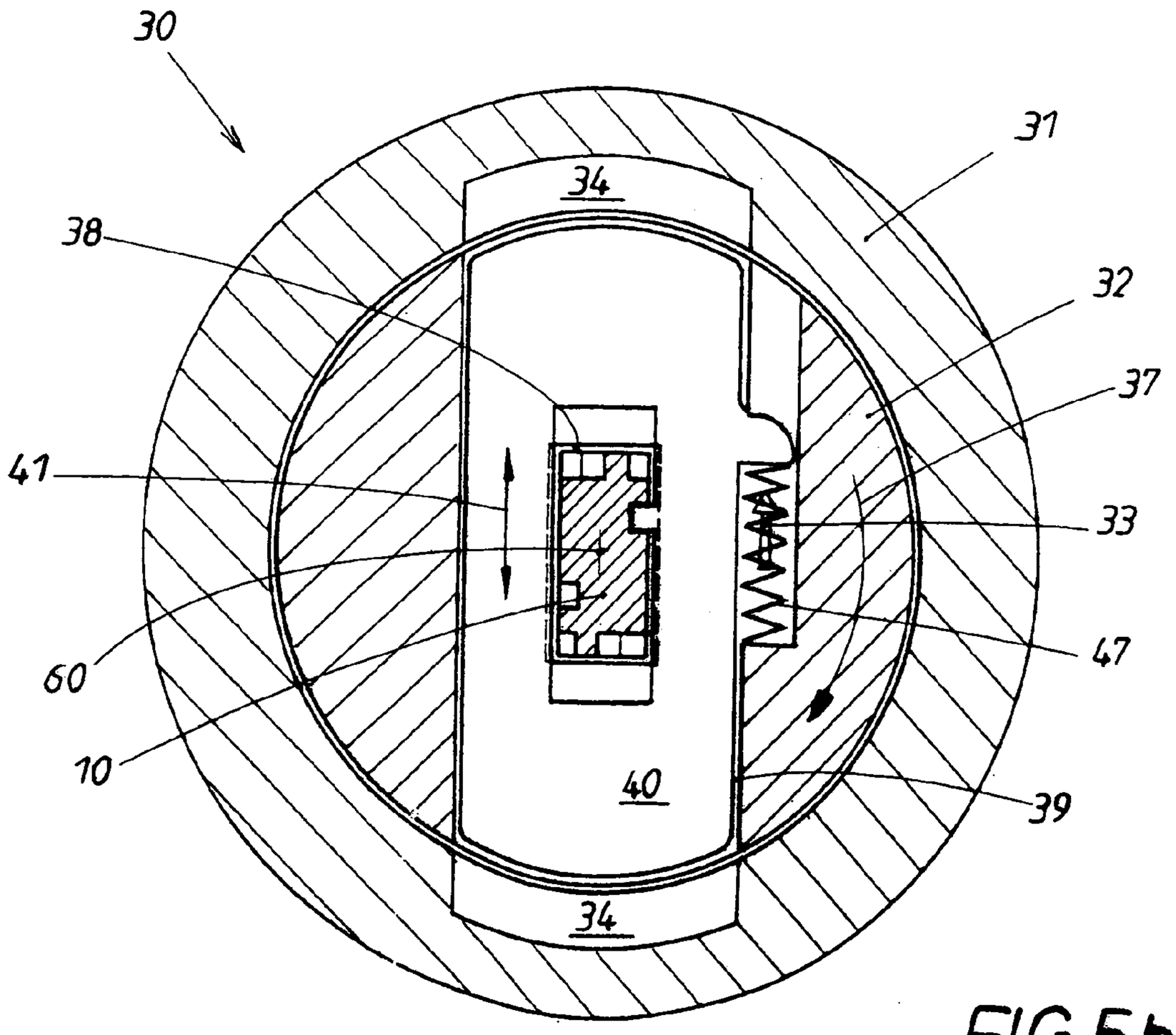


FIG.5b

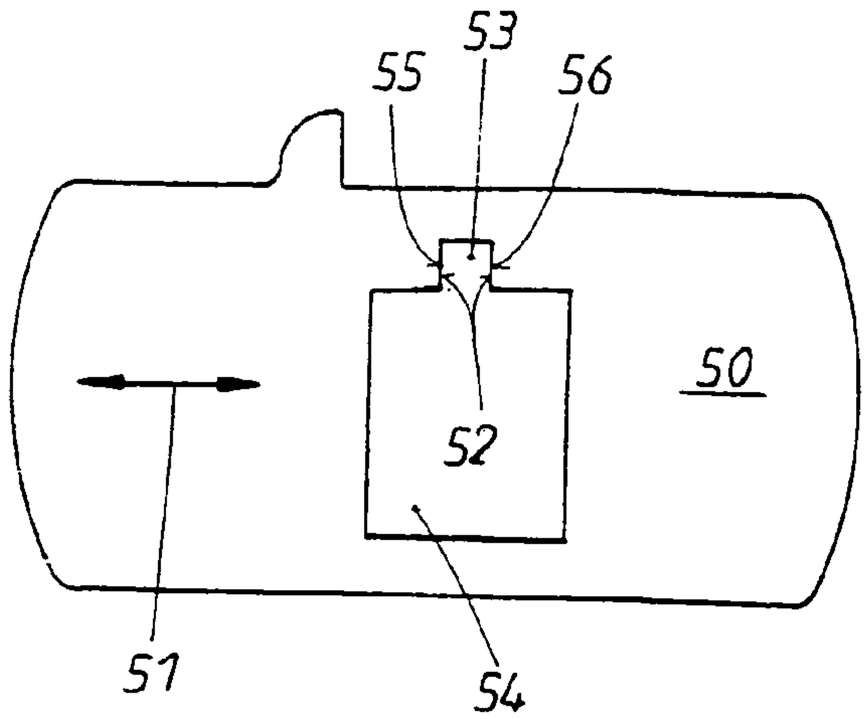


FIG.6a

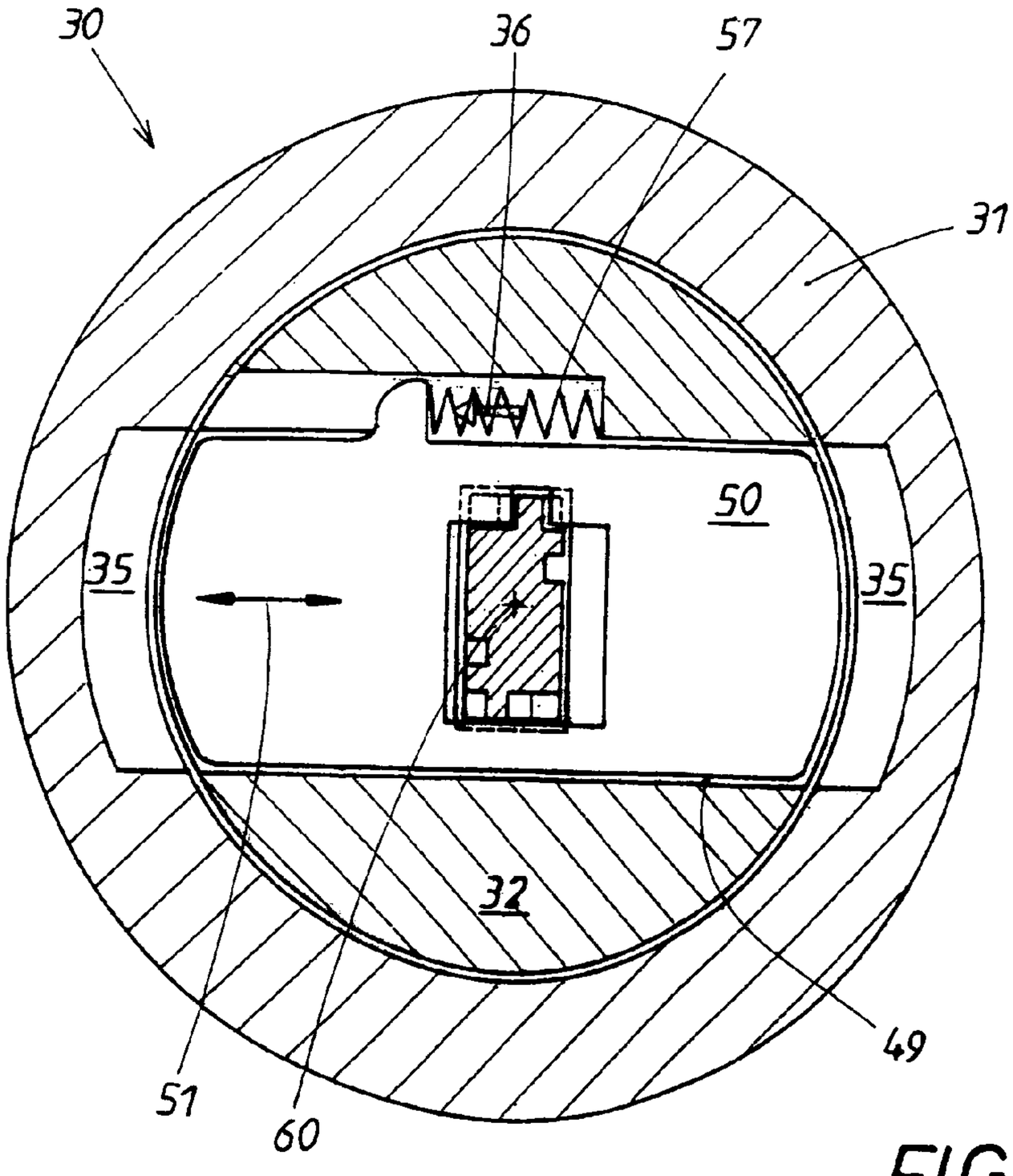


FIG.6b

LOCKING DEVICE COMPRISING A KEY AND A LOCKING CYLINDER

The invention is directed to a closure device of the kind indicated in the preamble of the claim **1**. Such a device is known from the German patent 19944 070 C2. There, the key is formed as a flat key, which has a control groove for projections of corresponding platelet tumblers on its broad outer face. Since here a reversible key is concerned, agreeing and fitting control grooves are inserted at the broad faces disposed opposite to each other. A straight line flute is disposed at the narrow sides for typing the key, which flute does not cooperate with the platelet tumblers.

Such closure devices equipped with platelet tumblers have proven useful in connection with motor vehicles. Unauthorized persons make an effort with break-in tools for stealing a motor vehicle, for example by a so-called "picking system", to sort the platelet tumblers in the key channel to the cross-section of the cylinder core, whereby the regularly spring-loaded platelet tumblers release of the cylinder core for rotation.

It is an object of the present invention to develop a reliable closure device of the kind recited in the preamble of claim **1**, wherein the reliable closure device is characterized by a high safety against break-in. This is achieved by the features recited in the characterizing part of claim **1**, which have the following particular characteristics.

Since the platelet tumblers of the two types are shiftable in different radial directions from each other, it is not possible without further steps to open the closure cylinder by way of a break-in tool. Depending on the position of the different platelet tumblers, one would need different tools, wherein the handling of the different tools is mutually interfering.

This is in particular then the situation where the control tracks for the two types of the platelet tumblers are formed opposite to each other, that is on the one hand concave or on the other hand convex. The one type can exhibit control tracks in the form of a control groove and the other type in the form of a control rib. Correspondingly, the counter sensing position pairs are formed oppositely in these two types. The counter sensing position pairs in case of a control groove are formed from the counter flanks of a radial projection, wherein the radial projection engages into the control groove. The counter sensing position pairs of in case of a control rib are formed of a radial recess, wherein the flanks directed opposite to each other serve for gripping around the control rib. The platelet tumblers with projections namely cannot be adjusted with those break-in tools, which would be required by the platelet tumblers with projections. Therefore the closure devices according to the present invention are very safe against break-in.

Further steps and advantages of the invention result from the sub claims, the following description and the drawings. The invention is presented in one embodiment example in the drawings. There is shown in:

FIG. **1** a prospective view of the shaft of a key of the invention device,

FIG. **2** an enlarged cross-section through the key of FIG. **1** along this section line II-II of FIG. **1**, wherein in this case the key is a flat profile with two narrow and two broad outer faces,

FIG. **3** a side elevational view of the invention key with a direction of view to a broad outer face of the flat key,

FIG. **4** a top planar view onto the narrow outer face of the key of FIG. **1**, **2**,

FIG. **5***a* an enlarged top planar view onto a platelet tumbler of a first type in the locking cylinder of the device of the present invention,

FIG. **5***b* a schematic presentation not to scale of a cross-section through the locking device according to the present invention with view onto the platelet tumbler of FIG. **5***a* with inserted proper key,

FIG. **6***a* in a presentation analogous to that of FIG. **5***a* showing a top planar view onto a second kind of platelet tumblers, which are arranged in alternating sequence with those of the FIG. **5***a* in the same cylinder core of the locking device according to the present invention,

FIG. **6***b* in a presentation corresponding to that of FIG. **5***b* showing a cross-section through the locking device according to the present invention with inserted key from which the interaction of the key with the tumbler platelet of the second type of FIG. **6***a* results.

FIGS. **1** and **2** show the particular key **10** belonging to the locking device according to the present invention, wherein the cross-section **11** of the key **10** is a flat profile. The flat profile is a rectangular cross-section with two broad outer faces **12** and with two narrow outer faces **13** in each case disposed pair wise opposite to each other. All four outer faces **12**,**13** are furnished with control tracks **21**,**22**. Outer faces **12**, **13** immediately neighboring to each other are equipped with control tracks formed opposite to each other, namely at the broad outer faces **12** there the control track is formed as a control groove **21**, whereas in each case a control rib **22** is disposed at the narrow outer faces **13**. While the one control track **21** is formed concavely and is recessed from its outer face **12**, the second control track **22** is formed convexly and projects from the outer face **13** of the key **10**. The control groove **21** has an essentially constant breadth **23** of the groove apart from the initial section **20** of the control groove **21**. An analogous situation holds also for the control rib **22**, which also exhibits an essentially constant breadth **24** of the rib when viewed in the plane of the cross-section of the key.

The key **10** cooperates with a lock cylinder **30** belonging to the locking device according to the present invention. The lock cylinder **30** comprises a stationary fixed cylinder housing **31**, wherein a cylinder core **32** is rotatably supported in the cylinder housing **31**. The cylinder core **32** has two kinds **39**, **49** of axially successively disposed chambers **39**, wherein two different types **40**,**50** of tumbler platelets are disposed in alternating sequence in the chambers **39**, wherein the view of the tumbler platelets will result from FIGS. **5***a*, **5***b*. The one chamber kind **39** extends parallel to the broad outer face **12** of the inserted key **10**, while the other kind **49** runs at an angle thereto, in particular perpendicular thereto, namely parallel to the narrow outer face **13** of the inserted key **10**. The associated spring-loadings **33**, **36** are illustrated by force arrows in FIGS. **5***b*, **6***b*, wherein the spring loadings **33**,**36** are generated by springs **47**, **57** disposed at an angle relative to each other and wherein the springs **47**, **57** strive to press the platelet tumblers **40**, **50** on their end side into one of two diametrically locking channels **34**,**35** in case of a missing key or in case of a false key. Then the cylinder core **32** is blocked in the cylinder housing **31** and is not rotatable in the sense of the arrow **37**.

The associated regular key **10** has to be inserted into an axial key channel **38** for performing a rotation **37** of the cylinder core **32**. Only then the tumblers **40**, **50** are sorted onto the cross-section of this cylinder core **32** recognizable in the FIGS. **5***b* and **6***b*. The cylinder core **32** can be rotated by the key from a rest position recognizable in FIGS. **5***b*, **6***b* into one of several work positions, whereby certain functions are triggered in the associated vehicle. The functions are suitable for a securing and releasing of locks and/or for starting, switching on or switching off of a motor in the vehicle and/or for an unbolting or a bolting of the steering of a vehicle.

Both the control groove **21** as well as the control rib **22** in each case have sensing position pairs **18** or **19** for the interaction between key **10** and platelet tumblers **40**, **50** respectively. The sensing position pairs **18** or **19** are formed in each case by the groove flanks **25**, **26** or by the rib flanks **65**, **66** according to FIGS. **3** or **4** respectively. Both the control groove **21** as well as the control rib **22** have an essentially constant groove breadth **23** or, respectively, rib breadth **24** over their complete control length. Case-by-case this can also be realized by different breadth **23**,**24** in different key sections. The sensing positions at the respective control tracks **21**, **22** marked in FIGS. **3** and **4** with **14.1** to **14.5** on the one hand and with **15.1** to **15.5** on the other hand are decisive at the respective control tracks **21**, **22**, wherein either the first type **40** or the second type **50** of the platelet tumblers engages the respective control tracks **21**,**22**. These positions are marked in FIG. **3** by arrows and are designated by **40.1** to **40.5**, whereas these are the sensing position **50.1** to **50.5** in FIG. **4**, wherein the second type **50** of the platelet tumblers engages in case of use of the locking device with inserted key **10**.

The sequential arrangement of the two types **40**, **50** of the two platelet tumblers is The chambers **39** or **49** for the platelet tumblers **40** or **50** respectively are staggered relative to each other by a measure **48** recognizable from FIG. **4**. The tumblers of the other type **40** are disposed in the middle of the distance between the platelet tumbler type **50**. In each case only one of the corresponding control tracks **21** or **22** resting on the two oppositely disposed outer faces **12** or **13** respectively is used. This allows the use of the key as a so-called "reversible key". It is to be understood that the two types **40**, **50** of the platelet tumblers can also be arranged in a different way in the cylinder core **32**. Thus it would be for example possible to furnish a mirror image arrangement of the associated platelet tumblers **40** at the arrangement positions **40.2** and **40.4** clarified in FIG. **3** and versus the other arrangement positions **40.1**, **40.3**, **40.5**. Then the projections **43** grip the front side control groove **21** in one case and in another case into the backside analogous control groove of the key **10**. The function as the reversible key is here retained. Analogous considerations hold also for the other type **50**.

Varying the position of the sensing locations **18** or **19** in the control groove **21** or the control rib **22** in the perpendicular directions **16** or **17** respectively results in a coding of the key. Four step heights **61** to **64** for the groove sensing position **18** are furnished in the present case as is shown in FIGS. **2** and **3**. There are four analogous step heights **61'** to **64'** for the arrangement of the control rib **22**. It is to be understood that the variations **61** to **64** for the control groove **21** can be formed different as desired from the variations **61'** to **64'** of the control rib **22**.

It is important that the direction of the shifts **41**, **51** of the two sided types **40**, **50** of platelet tumblers are arranged at an angle **58** to each other, wherein the angle **58** results from FIG. **1**. This angle **58** is a right angle in the present embodiment example because of said rectangular cross-section **11**.

LIST OF REFERENCE CHARACTERS

10 key
11 key cross-section, flat profile
12 broad outer face of **10**
13 narrow outer face of **10**
14.1 first sensing position at **10** for **40** (FIG. **3**)
14.2 second sensing position at **10** for **40** (FIG. **3**)
14.3 third sensing position at **10** for **22** (FIG. **3**)
14.4 fourth sensing position at **10** for **22** (FIG. **3**)

14.5 fifth sensing position at **10** for **22** (FIG. **3**)
15.1 first sensing position of **10** on **22** (FIG. **4**)
15.2 second sensing position of **10** on **22** (FIG. **4**)
15.3 third sensing position of **10** on **22** (FIG. **4**)
15.4 fourth sensing position of **10** on **22** (FIG. **4**)
15.5 fifth sensing position of **10** on **22** (FIG. **4**)
16 cross direction for variation of **21** in **12** (FIG. **3**)
17 cross direction for variation of **22** in **13** (FIG. **4**)
18 sensing position pair at **14.1** to **14.5** (FIG. **3**)
19 sensing position pair of **22** and **15.1** to **15.5** (FIG. **4**)
20 start piece of **21**
21 linear control track, first type, control groove
22 linear control track, second type, control rib
23 track breadth of **21**, groove breadth
24 track breadth of **22**, rib breadth
25 first groove flank of **18**
26 second groove flank of **18**
27 plane of cross-section of **10**
28 control effective key length of **10**
29 key longitudinal direction of **10**
30 lock cylinder
31 cylinder housing of **30**
32 cylinder core of **30**
33 spring loading of **40**
34 blocking channel for **40** in **32**
35 blocking channel for **50** in **32**
36 spring loading for **50**
37 rotary arrow of **32**
38 key channel for **10** in **32**
39 first kind of chambers in **32** for **40** (FIG. **5***b*)
40 first type of the platelet tumblers (FIG. **5***a*, **5***b*)
40.1 first attack position of **40** in **21** (FIG. **3**)
40.2 second attack position of **40** in **21** (FIG. **3**)
40.3 third attack position of **40** in **21** (FIG. **3**)
40.4 fourth attack position of **40** in **21** (FIG. **3**)
40.5 fifth attack position of **40** in **21** (FIG. **3**)
41 shifting direction of **40** (FIG. **5***b*)
42 counter sensing position pair at **40** (FIG. **5***a*)
43 radial projection of **40** (from FIG. **5***a*)
44 window in **40** for **10** (FIG. **5***a*)
45 first counter flank of **43** (FIG. **5***a*)
46 second counter flank of **43** (FIG. **5***a*)
47 spring for **53** (FIG. **5***b*)
48 offset of the arrangement between **40**, **50** in **32** (FIG. **4**)
49 second kind of chambers in **32** for **50** (FIG. **6***b*)
50.1 first sensing position of **50** at **22**
50.2 second sensing position of **50** at **22**
50.3 third sensing position of **50** at **22**
50.4 fourth sensing position of **50** at **22**
50.5 fifth sensing position of **50** at **22**
51 shifting direction of **50** (FIG. **6***a*)
52 counter sensing position pair of **50** (FIG. **6***a*)
53 radial recess in **50** for **10** (FIG. **6***a*)
54 window in **50** for **10** (FIG. **6***a*)
55 first counter flank of **52** (FIG. **6***a*)
56 second counter flank of **52** (FIG. **6***a*)
57 spring for **36** (FIG. **6***b*)
58 angle between **41**, **51** (FIG. **1**)
60 cylinder axis of **30** (FIG. **5***a*, **5***b*)
61 first step height of **18** (FIG. **2**,**3**)
61' first step height of **19** (FIG. **2**)
62 second step height of **18** (FIG. **2**,**3**)
62' second step height of **19** (FIG. **2**)
63 third step height of **18** (FIG. **2**,**3**)
63' third step height of **19** (FIG. **2**)
64 fourth step height of **18** (FIG. **2**,**3**)
64' fourth step height of **19** (FIG. **2**)

65 first rib flank of **22** (FIG. **4**)
66 second rib flank of **22** (FIG. **4**)

The invention claimed is:

1. Lock device with a key (**10**) and with a lock cylinder (**30**), comprising a spatially fixed cylinder housing (**31**) with a plurality of platelet tumblers,

wherein the platelet tumblers are radially shiftable relative to a cylinder axis (**39**)during insertion of the key (**10**) into an axial key channel (**38**) of the cylinder core (**32**) in order to sort the platelet tumblers on a cross-section of the cylinder core (**32**),

wherein the key (**10**) has an edge profile with several planar outer faces (**12**, **13**) running at an angle to each other,

wherein a control track extends in a longitudinal direction (**29**) of the key on an outer face and exhibits a pair of sensing positions (**18**, **19**) for each of the platelet tumblers engaging the control track, wherein the sensing positions are disposed opposite to each other in a key cross-section (**11**),

wherein for a coding the position of the sensing position pairs (**18**, **19**) of the control track in the successively following key sensing positions (**14.1** to **14.5**, **50.1** to **15.5**) varies in a direction (**16**, **17**) perpendicular to the key longitudinal direction (**29**), and

wherein for an analogous counter coding the platelet tumblers are located parallel to the cross-section of the cylinder core (**32**) and engage a corresponding sensing position pair (**18**, **19**) of the control track when the key (**10**) is inserted,

characterized in that at least two types (**40**, **50**) of platelet tumblers are disposed in the cylinder core (**31**),

wherein the platelet tumblers can be shifted in two radial directions (**41**, **51**) different from each other, since the platelet tumblers of a first type (**40**) can be shifted (**41**) parallel to a first outer face (**12**) of the key (**10**) and the platelet tumblers of a second type (**50**) can be shifted (**51**) parallel to a neighboring second outer face (**13**),

wherein a first control track (**21**) of the first type (**40**) of the platelet tumblers is positioned at the first outer face (**12**) of the key (**10**) and a second control track (**22**) of the second type (**50**) is positioned at the second outer face (**13**),

wherein counter sensing positions (**42**) of the platelet tumblers of the first type (**40**) engage the first control track (**21**) and the counter sensing positions (**52**) of the second type (**50**) engage the second control track (**22**),

wherein the key (**10**) has a multi-edge profile with several planar outer faces (**12**, **13**), each of the outer faces (**12**, **13**) having control tracks, and

wherein the control tracks are formed either as a control groove (**21**) or as a control rib (**22**),

and wherein the first control track and the second control track (**21**,**22**) mainly have a constant track breadth apart from an initial section (**20**) at the free end of the key.

2. Lock device according to claim **1**, wherein the distance between the two counter sensing positions of an associated pair (**42**; **52**) of the platelet tumblers of the first and/or second type (**40**; **50**) is formed almost uniformly in the complete cylinder core.

3. Lock device according to claim **1**, wherein the distance between the sensing positions of the sensing position pair (**18**, **19**) at the first and/or second control track (**21**, **22**) is formed almost uniformly over the complete key length (**28**) effectively used for coding.

4. Lock device according to claim **1**, wherein the first or second control track consist of a control groove (**21**).

5. Lock device according to claim **1**, wherein the first or second control track consists of a control rib (**22**).

6. Lock device according to claim **4** and wherein the first control track is a control groove (**21**) and wherein the neighboring second control track is a control rib (**22**).

7. Lock device according to claim **1**, wherein the key (**10**) exhibits a four edge profile and all four planar outer faces (**12**, **13**) are furnished either with a control groove (**21**) or with a control rib (**22**), and that at neighboring outer faces in alternating sequence a control groove (**21**) and a control rib (**22**) are arranged.

8. Lock device according to claim **7**, wherein the key (**10**) exhibits a four edge flat profile (**11**), which has two narrow and two broad outer faces (**13**, **12**) disposed opposite to each other.

9. Lock device according to claim **7**, wherein the two outer faces (**12** or, respectively, **13**) disposed opposite to each other in the four edge profile of the key (**10**) are furnished with same control track profiles, and

wherein the key (**10**) is a "reversible key", which can be inserted in the cylinder core (**32**) in a reversed position.

10. Lock device according to claim **7**, wherein the control tracks, located on the outer faces (**12**, **13**) disposed opposite to each other, are formed either as a control groove (**21**) or as a control rib (**22**).

11. Lock device according to claim **7**, wherein at a key (**10**) with a flat profile (**11**) there are disposed control ribs (**22**) at the narrow outer faces (**13**) and control grooves (**21**) at the broad outer faces (**12**).

12. Lock device according to claim **1**, wherein the platelet tumblers of the fist and the second type (**40**, **50**) are arranged in an alternating sequence in the cylinder core (**32**).

13. Lock device according to claim **4**, wherein the sensing position pairs (**18**) at a control groove (**21**) consist of two groove flanks (**25**, **26**), which are disposed in the same plane (**27**) as the cross-section (**11**) of the key (**10**) and are directed opposite to each other.

14. Lock device according to claim **5**, wherein the sensing position pairs (**19**) at a control rib (**22**) comprise two rib flanks (**65**, **66**), which are disposed in a cross-sectional plane (**27**) of the key (**10**) and are directed away from each other.

15. Lock device according to claim **13** wherein the counter sensing positions (**52**) of the platelet tumblers of the second type (**50**), which engage a control rib (**22**) when the key (**10**) is inserted, are generated by two oppositely directed counter flanks (**55**, **56**) of a radial recess (**53**) in the platelet tumblers.

16. Lock device according to claim **14** wherein the counter sensing positions (**42**) of the platelet tumblers of the first type (**40**), which engage in a control groove (**21**) when the key (**10**) is inserted, are generated by two counter flanks (**45**, **46**) directed away from each other of a radial projection (**43**) of the platelet tumblers.

17. Lock device according to claim **15**, wherein the radial projection (**43**) of the platelet tumblers of the first type (**40**) are disposed at an angle to the radial recesses (**53**) of the platelet tumblers of the second type (**50**).

18. Lock device according to claim **17** wherein the angle is a right angle at the key (**10**) with flat profile (**11**) or four edge profile.

19. A key, comprising:

a key body having a plurality of edge profiles, each edge profile having a planar base and a control track configured to interact with a tumbler of a lock, a first control track on a first planar base being a rib extending from the planar base and having a constant width from the planar base to an outer radial surface from a center of the key body, and a second control track on a second planar base

being a groove recessed in the planar base and having a mainly constant track breadth along a length of the key body except at a free end of the key,

wherein each planar base is at an angle with respect to each neighboring planar base and parallel to a planar base on an opposite side of the key body.

* * * * *